

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-230714

(43)Date of publication of application : 05.09.1997

(51)Int.Cl.

G03G 15/16

G03G 15/01

(21)Application number : 08-066957

(71)Applicant : RICOH CO LTD

(22)Date of filing : 22.03.1996

(72)Inventor : AOTO ATSUSHI
HIRANO YASUO
YAMASHITA MASAHIDE
SETO MITSURU
FUKUDA SHIGERU

(30)Priority

Priority number : 07 76743
07335560Priority date : 31.03.1995
22.12.1995

Priority country : JP

JP

(54) IMAGE FORMING DEVICE USING INTERMEDIATE TRANSFER SYSTEM AND METHOD THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To enhance cleanability and transfer efficiency and to obtain an image not for generating a nibbled print by specifying the contact angle of the surface material of an intermediate transfer body with water and making the surface material more positive than toner, in a triboelectrification series.

SOLUTION: In this image forming method adopting the intermediate transfer system of primarily transferring a negatively charged toner image formed on an image carrier onto the intermediate transfer body and further, secondarily transferring the negatively charged toner image onto a transfer material, the surface material of the intermediate transfer body has a contact angle of 70° or more with the water and is more positive than the toner in the triboelectrification series. In other words, the intermediate transfer body having the surface whose contact angle with the water is $\geq 70^\circ$, preferably 80–120° is used. Further, for suppressing the generation of local great Coulomb's force between the intermediate transfer body and the toner, a triboelectric charge quantity by friction with the surface of the intermediate transfer body is set within the range of $-40-0\mu\text{C/g}$, preferably $-30-0\mu\text{C/g}$, in negatively charged toner and $0-40\mu\text{C/g}$, preferably $0-30\mu\text{C/g}$, in positively charged toner.

LEGAL STATUS

[Date of request for examination]

03.09.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] Image formation equipment with which a contact angle [as opposed to water in a charge of facing of this middle imprint object] is 70 degrees or more, and a frictional electrification sequence is characterized by being positive rather than a toner in image formation equipment of a middle imprint method which imprints primarily a negative electrification toner image formed on image support on a middle imprint object, and is further imprinted secondarily on imprint material.

[Claim 2] Image formation equipment according to claim 1 characterized by the amount of frictional electrifications of a toner by friction with a middle imprint body surface being $-40-0\text{microC/g}$.

[Claim 3] Image formation equipment with which a contact angle [as opposed to water in a charge of facing of this middle imprint object] is 70 degrees or more, and a frictional electrification sequence is characterized by being negative rather than a toner in image formation equipment of a middle imprint method which imprints primarily a positive electrification toner image formed on image support on a middle imprint object, and is further imprinted secondarily on imprint material.

[Claim 4] Image formation equipment according to claim 3 characterized by the amount of frictional electrifications of a toner by friction with a middle imprint body surface being $0-40\text{microC/g}$.

[Claim 5] An image formation method that a contact angle over water of the charge of facing is 70 degrees or more as this middle imprint object, and a frictional electrification sequence of the charge of facing is characterized by using what is positive rather than a toner in an image formation method of a middle imprint method which imprints primarily a negative electrification toner image formed on image support on a middle imprint object, and is further imprinted secondarily on imprint material.

[Claim 6] An image formation method according to claim 5 characterized by the amount of frictional electrifications of a toner by friction with a middle imprint body surface being $-40-0\text{microC/g}$.

[Claim 7] An image formation method that a contact angle over water of the charge of facing is 70 degrees or more as this middle imprint object, and a frictional electrification sequence of the charge of facing is characterized by using what is negative rather than a toner in an image formation method of a middle imprint method which imprints primarily a positive electrification toner image formed on image support on a middle imprint object, and is further imprinted secondarily on imprint material.

[Claim 8] An image formation method according to claim 7 characterized by the amount of frictional electrifications of a toner by friction with a middle imprint body surface being $0-40\text{microC/g}$.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] About the image formation equipment which used electrophotography methods, such as a copying machine, a printer, and facsimile, in detail, this invention makes middle imprint objects, such as a middle imprint belt, intervene, and relates to the image formation equipment and the image formation method using the middle imprint method accompanied by primary and a secondary imprint stroke.

[0002]

[Description of the Prior Art] Generally the full color image is expressed by piling up the three primary colors of cyanogen, a Magenta, and yellow at least, and full color image formation equipment has composition which imprints two or more color images in piles to one transfer medium. It is divided roughly into the imprint drum method which specifically carries out the sequential imprint of the color image at the imprint material fixed to imprint drum lifting, and obtains a full color image, and the middle imprint method which imprints a color image primarily one by one on a middle imprint object, bundles up the primary transfer picture and is secondarily imprinted to imprint material. If these imprint methods are compared, a middle imprint method has paper free nature and an advantageous complete copy in respect of possible **.

[0003] The image formation equipment which used the middle imprint method for below is explained. The outline of full color electrophotography equipment in which the middle imprint method was used for drawing 1 is shown. The toner image of the Isshiki eye develops the latent image formed on the photo conductor 13 in the development section 4, and it is primarily imprinted in the contact section with the middle imprint object 6 to the middle imprint object 6. When full color, this stroke is repeated by three classification by color or 4 colors, and a full color image is formed on a middle imprint object. Next, the full color image formed on the middle imprint object is secondarily imprinted by package on the imprint material 24, such as paper, in a field 11. Then, the imprint material 24 is outputted to drawing 1 as a full color image through the fixing stroke which is not illustrated. Conventionally, the SUWI par brush 8 is installed as a means to supply lubricant to a middle imprint object.

[0004] In such a middle imprint method, in order to obtain sufficient image concentration, the image formed in the middle imprint object requires that imprint effectiveness should moreover be imprinted by imprint material at 90% or more to homogeneity. However, the toner which should be imprinted essentially remained in part on the middle imprint object, and there was a trouble that many abnormality images called the so-called vermin print with which the toner does not appear in some images were seen. Although the material which was excellent in the middle imprint object material at the mold-release characteristic with toners, such as a fluororesin, was proposed as a means to solve this problem, the vermin print was not lost completely. As technology for improving a worm-eaten print further, so, to JP,58-187968,A The method of supplying an organic fluorine system compound to a middle imprint body surface to JP,2-198476,A The method of adding a wettability control agent into a middle imprint object material to JP,2-213881,A The way the method of forming in a middle imprint body surface the protective coat which has the lubricity of zinc stearate etc. controls the surface roughness to JP,3-242667,A again, using silicone rubber as a middle imprint object material is proposed. In addition to the technology which raises the lubricity of these middle imprint body surface, the technology of removing the adhering residual toner mechanically is also proposed. For example, the way the method which the way the method of preparing a peripheral-speed difference in the contact member of a middle imprint object, and grinding a middle imprint body surface grinds the surface to JP,5-307344,A when toner filming occurs in a middle imprint body surface grinds after detecting middle imprint body surface granularity to JP,5-313526,A grinds a middle imprint object for every fixed copy number of sheets to JP,5-323802,A again is proposed by JP,4-305666,A. However, it is difficult to maintain the image of the image quality always stabilized also in repeat use by the method of supplying lubricant to these middle imprint body surface, or the method of grinding a middle imprint body surface. Moreover, the timing-control equipment is needed for a coater, polishing equipment, and a pan, and equipment is complicated, and it becomes cost high. Moreover, after performing corona-electrical-charging processing to the toner image formed on the middle imprint belt and adjusting the amount of electrifications of a toner to JP,5-210315,A, it is proposed by imprinting to a transfer paper that higher imprint effectiveness is realizable. However, even if it uses such a method, although imprint effectiveness increases, a local poor imprint, i.e., a vermin print, is not lost completely.

[0005]

[Problem(s) to be Solved by the Invention] In the image formation equipment and the method of using a middle imprint method, this invention solved the above-mentioned technical problem, i.e., it excels in the imprint

effectiveness from the cleaning nature of a middle imprint object, and a middle imprint object to imprint material, and it aims at offering the image formation equipment and the method of obtaining the image which does not generate especially a worm-eaten print also in repeat use.

[0006]

[Means for Solving the Problem] According to this invention, in an image formation method of a middle imprint method which imprints primarily a negative electrification toner image formed on image support on a middle imprint object, and is further imprinted secondarily on imprint material, a contact angle [as opposed to water in a charge of facing of this middle imprint object] is 70 degrees or more, and a frictional electrification sequence offers image formation equipment characterized by being positive rather than a toner. Moreover, according to this invention, the image-formation equipment which imprints primarily a positive electrification toner image formed on image support on a middle imprint object, and is characterized by for a contact angle [as opposed to water in a material of the surface in which a toner image of this middle imprint object is formed] to are 70 degrees or more in an image-formation method of a middle imprint method secondarily imprinted on an imprint material, and for a frictional electrification sequence to are negative from a toner further offers. In an image formation method of a middle imprint method which imprints primarily a negative electrification toner image formed on image support on a middle imprint object, and is furthermore further imprinted secondarily on imprint material according to this invention An image formation method which a contact angle over water of the charge of facing is 70 degrees or more as this middle imprint object, and is characterized by a frictional electrification sequence of the charge of facing using what is positive from a toner is offered. Furthermore, it sets to an image formation method of a middle imprint method which according to this invention imprints primarily a positive electrification toner image formed on image support on a middle imprint object, and is further imprinted secondarily on imprint material again. An image formation method which a contact angle over water of the charge of facing is 70 degrees or more as this middle imprint object, and is characterized by a frictional electrification sequence of the charge of facing using what is negative from a toner is offered.

[0007] In order for a toner image formed in a middle imprint body surface to be efficiently imprinted by imprint material, the mold-release characteristic of a middle imprint body surface and a toner must be excellent. As a factor which controls this mold-release characteristic, there are the compatibility of a both material, surface smooth nature, etc. It is considerably improvable if a contact angle [as opposed to water for a middle imprint body surface] is made into 70 degrees or more to this. In this invention, a contact angle over surface water uses a middle imprint object which is 80 - 120 degrees preferably 70 degrees or more. Furthermore, it is necessary to also consider Coulomb force between a middle imprint object and a toner as a controlling factor of a mold-release characteristic. In order to abolish a vermin print especially, it is important to press down generating of strong local Coulomb force produced between a middle imprint object which is the cause of generation, and a toner. for this reason — being alike — the amount of frictional electrifications by friction with a middle imprint body surface — a case of a negative electrification toner $-40\text{--}0\mu\text{C/g}$ — on the other hand, in the case of a positive electrification toner, a good image is preferably obtained in the range of $-30\text{--}0\mu\text{C/g}$ $0\text{--}40\mu\text{C/g}$ and by setting it as the range of $0\text{--}30\mu\text{C/g}$ preferably. If the amount of frictional electrifications crosses said specific range, it will be easy to generate an abnormality image.

[0008] Drawing 2 shows an electrification condition in primary [when using a negative electrification nature toner], and a secondary imprint production process. The toner 22 immediately after the middle imprint object 6 imprinted primarily is uniformly charged in negative like drawing 2 (a). However, if SHIEA, such as a pressure and *****, starts between a toner and a middle imprint object in a secondary imprint field, the toner 23 to which the frictional electrification property of a middle imprint body surface is charged in reversed polarity (positive) on a middle imprint body surface like drawing 2 (b) by friction between a toner and a middle imprint object when negative polarity is stronger than a toner comes to exist. Although a secondary imprint to the imprint material 24, such as paper, is performed when the electric field E of a toner and reversed polarity (positive) are applied to imprint material and a toner 22 moves to the imprint material 24 according to the electrostatic force, the toner 23 in which polarity reversed and carried out positive electrification does not move to the imprint material 24, but remains on the middle imprint object 6. Furthermore, with a toner which carried out positive electrification, Coulomb force acts on the toner 22 which is carrying out negative electrification, a poor imprint is caused, the non-imprinted toner 27 remains on the middle imprint object 6, and a worm-eaten print is generated (drawing 2 (c)). By moreover, friction [in / when positive electrification has a middle imprint body surface too stronger than a toner / a secondary imprint field] The amount of electrifications of a toner which is in contact with a middle imprint object becomes excessive, and Coulomb force F2 between a toner and a middle imprint object becomes larger than Coulomb force F1 by imprint electric field ($F2 > F1$). A poor imprint is caused, the non-imprinted toner 27 remains on the middle imprint object 6, and a vermin print is generated (drawing 2 (d)).

[0009] Then, like this invention, when using a negative electrification nature toner, and a surface frictional electrification sequence uses from a toner a middle imprint object which is positive, if it can prevent that a toner is reversed to reversed polarity and lengthens by friction of a middle imprint object and a toner, generation of a vermin print can also be controlled. Moreover, if a surface frictional electrification sequence uses from a toner a middle imprint object which is negative when using a positive electrification nature toner, a vermin print can be controlled similarly.

[0010] as the amount of frictional electrifications with a middle imprint body surface of a toner — a case of a negative electrification nature toner $-40\text{--}0\mu\text{C/g}$ $-30\text{--}0\mu\text{C/g}$ is preferably good. moreover, a case of a

positive electrification nature toner -- 0-40microC/g -- 0-30microC/g is preferably good. When the amount of electrifications is too large, Coulomb force F2 of a middle imprint object and a toner becomes larger than the force F1 by imprint electric field, and it becomes easy to cause a worm-eaten print by poor imprint by friction in a secondary imprint field (drawing 2 (d)). Of course, it is possible for until to suppress generating of a worm-eaten print to some extent by adjustment of imprint electric field in this case. However, imprint electric field superfluous in image concentration becoming inadequate are not needed and desirable.

[0011] Drawing 3 is equipment used for measurement of the amount of frictional electrifications of a middle imprint body surface and a toner. The metal rollers 32 and 33 of 100mm of diameters of a roller which covered the surface with the middle imprint object material 31 adjoin so that it may be parallel about a gap of 20 microns. Rollers 32 and 33 rotate with linear velocity of 100 mm/sec and 105 mm/sec, respectively, and hands of cut differ. 5g is added for a toner 30 to the contact field 34 of these rollers 32 and 33, and frictional electrification of the toner is carried out by friction with a middle imprint body surface material by making it rotate for 60 seconds. Then, it draws in from the suction opening 35 which attracts the toner 30 adhering to the middle imprint body surface material 31 with a vacuum pump 36, and the amount of electrifications of a toner is measured by electrometer 37. Moreover, weight of a toner at this time is measured and the amount of electrifications per unit weight is computed.

[0012]

[Example]

Melting kneading of the KETCHIEN black 8 weight section was carried out at the example 1 polyethylene-terephthalate (PET) 100 weight section, and the seamless belt was produced by extrusion molding and it considered as the middle imprint object base material. The spray coating cloth of the following materials was carried out to this base material, and the middle imprint body surface layer was formed. In addition, the mixed rate of a material is altogether expressed with the weight section below.

Fluororesin (Lumiflon 200; Asahi Glass Co., Ltd. make) The 100 sections (solid content)

The curing agent for Lumiflon (Asahi Glass) The 20 sections Carbon black (pudding tex 40; Degussa AG make) The six sections A leveling agent (KP321; the Shin-etsu chemistry company make) The one section Toluene The 200 sections Xylene The contact angle over the water of the surface layer of 200 **** was 80 degrees. The obtained middle imprint object material measured the amount of electrifications with the equipment of drawing 3 using the negative electrification nature toner. Moreover, the middle imprint object was used for the color copying machine (PURITERU 550; Ricoh make (drawing 1 and the SUWI par brush 8 are not installed)), and the test pattern image was outputted. An evaluation result is shown in a table 1. In addition, the cyanogen toner which carried out mixer mixing and obtained the hydrophobic silica 0.75 section in the particle fine-particles 100 section which said negative electrification nature toner ground and classified what carried out melting kneading of the following mixture, and was made into the particle size of about 7 microns was used. Moreover, the silicon resin coat carrier was used for the carrier.

Epoxy resin The 100 sections Copper phthalocyanine The 1.5 sections Salicylic-acid zinc salt derivative The 1.5 sections [0013] The spray coating cloth of the following materials was carried out to the PET seamless belt base material in example 2 example 1, and the middle imprint body surface layer was formed.

Silicon resin (SR2411; Toray Dow Corning silicone company make) The 100 sections (solid content)

Carbon black (pudding tex L; Degussa AG make) The five sections Leveling agent (KP321; the Shin-etsu chemistry company make) The one section Toluene The contact angle over the water of the surface layer of 300 **** was 75 degrees. It evaluated like the example 1 using the obtained middle imprint object material, and the result was shown in a table 1.

[0014] The spray coating cloth of the following materials was carried out to the PET seamless belt base material in example 3 example 1, and the middle imprint body surface layer was formed.

Silicon resin (SR2411; Toray Dow Corning silicone company make) The 100 sections (solid content)

Carbon black (pudding tex L; Degussa AG make) The five sections Leveling agent (KP321; the Shin-etsu chemistry company make) The one section Amino silane (SH6020; Toray Dow Corning silicone company make) The three sections Toluene The contact angle over the water of the surface layer of 300 **** was 73 degrees. Using the obtained middle imprint object material, it was similarly estimated as the example 1 and the result was shown in a table 1.

[0015] The middle imprint object was created like the example 3 except having made the amino silane of example 4 example 3 into the six sections. The contact angle over the water of this surface layer was 70 degrees. Using the middle imprint object material and the negative electrification nature toner which were obtained, it was similarly estimated as the example 1 and the result was shown in a table 1.

[0016] The middle imprint object was created like the example 3 except having made the amino silane of example 5 example 3 into the ten sections. The contact angle over the water of this surface layer was 70 degrees. Using the middle imprint object material and the negative electrification nature toner which were obtained, it was similarly estimated as the example 1 and the result was shown in a table 1.

[0017] a comparison -- melting kneading of the KETCHIEN black 7 weight section was carried out, and the seamless belt was produced by extrusion molding in the example 1 ethylene tetra-FURORO ethylene alternating copolymerization resin (ETFE; tetrafluoroethylene =48mol%) 100 weight section, and it considered as the middle imprint object at it. The contact angle over the water of this middle imprint object was 95 degrees. Using the middle imprint object material and the negative electrification nature toner which were obtained, it was similarly estimated as the example 1 and the result was shown in a table 1.

[0018] Melting kneading of the KETCHIEN black 7 weight section was carried out at the example of comparison 2 polyvinylidene-fluoride (PVdF (KF850; KUREHA)) 100 weight section, and the seamless belt was produced by extrusion molding and it considered as the middle imprint object. The contact angle over the water of this middle imprint object was 81 degrees. Using the middle imprint object material and the negative electrification nature toner which were obtained, it was similarly estimated as the example 1 and the result was shown in a table 1.

[0019] Melting kneading of the carbon black (Printex XE2; Degussa AG) 8 weight section was carried out at the example of comparison 3 polycarbonate (bisphenol A type) 100 section, and the seamless belt was produced by extrusion molding and it considered as the middle imprint object. In addition, the contact angle over the water of this middle imprint object was 45 degrees. Using the middle imprint object material and the negative electrification toner which were obtained, it was similarly estimated as the example 1 and the result was shown in a table 1.

[0020]

[A table 1]

表 1

	トナー帯電量 ($\mu\text{C/g}$)	虫食いランク	異常画像
実施例 1	-20.0	5	なし
2	-22.5	5	なし
3	-32.5	5	なし
4	-41.0	4	なし
5	-54.6	3	やや濃度薄い
比較例 1	+15.7	2	なし
2	+26.2	1	濃度薄い
3	-22.6	1	濃度薄い

虫食い評価ランク：

5：虫食い発生せず

4：肉眼では見えにくい程度の虫食いがわずかにある。

3：肉眼では見えにくい程度の虫食いがわずかにある。

2：肉眼ではっきりわかる大きさの虫食いが見られる。

1：肉眼ではっきりわかる大きさの虫食いが多数見られる。

[0021] Using examples 6-8, example 4 of comparison - 5 positive electrification nature cyanogen toner, the middle imprint object was similarly evaluated using examples 1, 2, 3, 4, and 5, and showed the result in a table 2. In addition, the cyanogen toner which carried out mixer mixing and obtained the hydrophobic silica 0.75 section in the particle fine-particles 100 section which said positive electrification nature toner ground and classified what carried out melting kneading of the following mixture, and was made into the particle size of about 7 microns was used.

Polyester resin The 100 sections Copper phthalocyanine The 1.5 sections Quarternary ammonium salt The 1.0 sections [0022] The following were added to the surface layer component of example 9 example 1, and also it was presupposed that it is the same.

[0023]

表 2

	使用した 中間転写体	トナー帯電量 ($\mu\text{C/g}$)	虫食い ランク	異常画像
実施例 6	実施例 1	+18.2	5	なし
7	実施例 2	+12.1	5	なし
8	実施例 3	+7.7	5	なし
比較例 4	実施例 4	-5.0	2	なし
5	実施例 5	-24.6	1	やや濃度薄い
実施例 9	実施例 1 + PTFE	+50.5	3	濃度薄い

虫食い評価ランク：表 1 と同様。

[0024]

[Effect of the Invention] By this invention, it excels in the imprint effectiveness from a middle imprint object to imprint material, and a high quality picture without especially a worm-eaten print can be obtained.

[Translation done.]

* NOTICES *

BEST AVAILABLE COPY

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is explanatory drawing of the image formation equipment by the middle imprint double imprint method.

[Drawing 2] It is explanatory drawing showing the electrification property at the time of an imprint.

[Drawing 3] It is explanatory drawing of the equipment which measures the amount of electrifications of this invention.

[Description of Notations]

1 Live Part 2 Exposure Section

3 Potential Sensor 4 Development Section

5 P Sensor 6 Middle Imprint Belt

7 Pcc 8 SUUI Par Brush

9 Drum Cleaning 10 Electric Discharge Lamp

11 Imprint 12 Separation

22 Negative Electrification Nature Toner 23 Reverse Electrification Toner

24 Imprint Material 25 Poor Imprint Part

30 Toner 31 Middle Imprint Object Material

32 33 Metal roller 34 Toner supply field

35 Suction Opening 36 Vacuum Pump

37 Electrometer

[Translation done.]

BEST AVAILABLE COPY

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

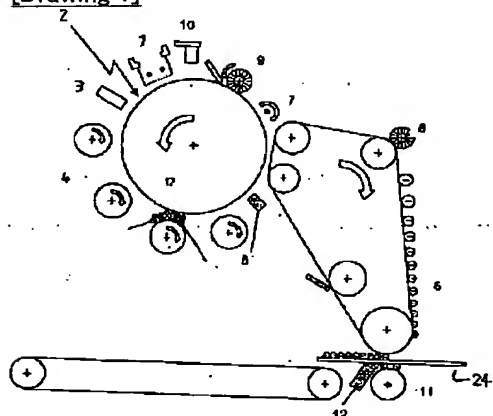
1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. **** shows the word which can not be translated.

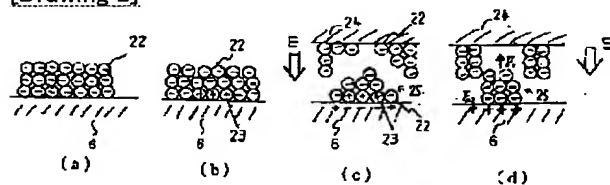
3. In the drawings, any words are not translated.

DRAWINGS

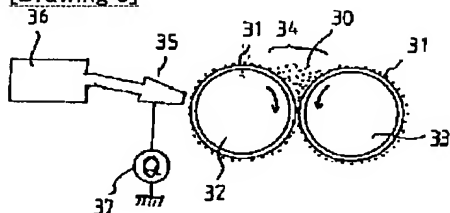
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]

特開平9-230714

(43)公開日 平成9年(1997)9月5日

(51)IntCl. ⁴	G 0 3 G 15/16	15/01	114	識別記号	片内整理番号	F I	G 0 3 G 15/16	15/01	114 A	技術表示箇所
(21)出願番号	特願平8-60957									
(22)出願日	平成8年(1996)3月22日									
(31)優先権主張番号	特願平7-76743									
(32)優先日	平7(1996)3月31日									
(33)優先権主張国	日本 (J P)									
(31)優先権主張番号	特願平7-33560									
(32)優先日	平7(1995)12月22日									
(33)優先権主張国	日本 (J P)									
(71)出願人	特願平8-60957									
	株式会社リコー									
(72)発明者	平戸 淳									
	東京都大田区中馬込1丁目3番6号									
(72)発明者	平野 孝男									
	東京都大田区中馬込1丁目3番6号									
(72)発明者	山下 昌秀									
	東京都大田区中馬込1丁目3番6号									

(54)【発明の名称】 中間転写方式を用いた画像形成装置及び画像形成方法

(57)【要約】

【目的】 本発明は、中間転写方式を用いる画像形成装置において、中間転写体のクリーニング性と中間転写体から転写材への転写効率に優れ、特に虫食い版面を発生しない画像を得ることを目的とするものである。

【構成】 中間転写方式を用いる画像形成装置において、該中間転写体の表面材料が、水に対する接触角が70度以上でかつ、摩擦帯電系列がトナーの帯電極性と逆極性側に帯電することを特徴とする画像形成装置に関する。また、像担持体上に形成される負帯電トナー画像を中間転写体上に一次転写し、さらに転写材上に二次転写する中間転写方式の画像形成方法において、該中間転写体として、その表面材料の、水に対する接触角が70度以上でかつその表面材料の摩擦帯電系列がトナーよりも正であるものを用いることを特徴とする画像形成方法に関する。

(2)

特開平9-230714

1

【特許請求の範囲】

【請求項1】 像担持体上に形成される負帯電トナー画像を中間転写体上に一次転写し、さらに転写材上に二次転写する中間転写方式の画像形成装置において、該中間転写体の表面材料が、水に対する接触角が70度以上でかつ摩擦帯電系列がトナーよりも正であることを特徴とする画像形成装置。

【請求項2】 中間転写体表面との摩擦によるトナーの摩擦帯電量が $-4.0 \sim 0 \mu C/g$ であることを特徴とする請求項1記載の画像形成装置。

【請求項3】 像担持体上に形成される正帯電トナー画像を中間転写体上に一次転写し、さらに転写材上に二次転写する中間転写方式の画像形成装置において、該中間転写体の表面材料が、水に対する接触角が70度以上でかつ摩擦帯電系列がトナーよりも負であることを特徴とする画像形成装置。

【請求項4】 中間転写体表面との摩擦によるトナーの摩擦帯電量が $0 \sim 4.0 \mu C/g$ であることを特徴とする請求項3記載の画像形成装置。

【請求項5】 像担持体上に形成される負帯電トナー画像を中間転写体上に一次転写し、さらに転写材上に二次転写する中間転写方式の画像形成方法において、該中間転写体として、その表面材料の、水に対する接触角が70度以上でかつその表面材料の摩擦帯電系列がトナーよりも正であるものを用いることを特徴とする画像形成方法。

【請求項6】 中間転写体表面との摩擦によるトナーの摩擦帯電量が $-4.0 \sim 0 \mu C/g$ であることを特徴とする請求項5記載の画像形成方法。

【請求項7】 像担持体上に形成される正帯電トナー画像を中間転写体上に一次転写し、さらに転写材上に二次転写する中間転写方式の画像形成方法において、該中間転写体として、その表面材料の、水に対する接触角が70度以上でかつその表面材料の摩擦帯電系列がトナーよりも負であるものを用いることを特徴とする画像形成方法。

【請求項8】 中間転写体表面との摩擦によるトナーの摩擦帯電量が $0 \sim 4.0 \mu C/g$ であることを特徴とする請求項7記載の画像形成方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、複写機、プリンター、ファクシミリ等の電子写真方式を用いた画像形成装置に関し、詳しくは中間転写ベルト等の中間転写体を介させて一次、二次転写行程を伴う中間転写方式を用いた画像形成装置及び画像形成方法に関する。

【0002】

【従来の技術】 一般にフルカラー画像は少なくともシアン、マゼンタ、イエローの3原色を重ね合わせることで、よって表現されており、フルカラー画像形成装置は、複

2

数の色画像を一つの転写媒体に重ねて転写する構成となっている。具体的には、転写ドラム上に固定された転写材に色画像を順次転写してフルカラー画像を得る転写ドラム方式と、中間転写体上に色画像を順次転写し、その一次転写画像を一括して転写材上に二次転写する中間転写方式に大別される。これらの転写方式を比べると、ペーパーフリー性や全面コピーが可能等の点で中間転写方式が有利である。

【0003】以下に、中間転写方式を用いた画像形成装置10 置について説明する。図1に中間転写方式を用いたフルカラー電子写真装置の概略を示す。感光体13上に形成された潜像は、現像部4にて一色目のトナー画像に顕像化され、中間転写体6との当接部にて中間転写体6へ一次転写される。フルカラーの場合、この行程を3色分あるいは4色分繰り返して中間転写体上にフルカラー画像を形成する。次に中間転写体上に形成されたフルカラー画像は、傾転11において線などの転写材24上に一括で二次転写される。その後、転写材24は図1には図示していない定着行程を経てフルカラー画像として出力される。従来は、中間転写体に潤滑剤を供給する手段として、スウィーパーブラシ8が設置されている。

【0004】このような中間転写方式においては、十分な画像濃度を得るためには、中間転写体に形成された画像は均一にしかも転写効率が90%以上で転写材に転写されることが必要である。ところが、本来転写されるべきトナーが中間転写体上に一部残ってしまい、画像の一部にトナーが載っていないいわゆる虫食い版面と呼ばれる異常画像が多く見られるという問題点があった。この問題を解決する手段として、中間転写体材料にフッ素樹脂等のトナーとの離脱性に優れた材料が提案されたが虫食い版面は完全にならなかつた。そこで、虫食い版面をさらに改善するための技術として、特開昭58-187968号公報には、有機フッ素系化合物を中間転写体表面に供給する方法が、特開平2-198476号公報には、中間転写体材料に離れ性制御剤を添加する方法が、特開平2-213881号公報には、中間転写体表面にステアリン酸亜鉛等の潤滑性を有する保護膜を形成する方法が、また特開平3-242667号公報には、中間転写体材料としてシリコンゴムを用い、その表面粗さを制御する方法が提案されている。これら中間転写体表面の潤滑性を向上させざる技術に加え、付着した残存トナーを機械的に除去する技術も提案されている。例えば、特開平4-305666号公報には、中間転写体の当接部材に潤滑剤を設け中間転写体表面を研磨する方法が、特開平5-307344号公報には、中間転写体表面にトナーフィリングが発生した時点で表面を研磨する方法が、特開平5-313526号公報には、中間転写体表面粗さを検知後研磨する方法が、また特開平5-323802号公報には、一定コピー枚数毎に中間転写体を研磨する方法が提案されている。しかしながら、こ

50

これら中間転写表面、潤滑剤を供給する方法や中間転写表面を研削する方法では、繰り返し使用においても常に安定した面質の面質を維持することは困難である。また、塗布装置や研削装置、さらにはそのタイミッド制御装置が必要となり、装置が複雑化し、またコスト高となす。特開平5-101315号公報には、中間転写トナー像に形成されたトナー像にコロナ帯電処理を施して、トナーの荷電量を調節してコロナ帯電に転写することにより、より高い転写効率を実現できることが提案されている。しかしながら、このような方法を用いても、転写効率が上がるものの、周所的な転写不良、すなわち虫食い版面は完全にはなくならない。

【0005】

【0005】
【発明が解決しようとする課題】本発明は、中間転写方式を用いる画像形成装置及び方法において、上記の問題を解決した。即ち中間転写体のクリーニング性と中間転写体から転写材への転写効率に優れ、特に虫喰い版面を発生しない画像を繰り返し使用においても得ることができ、画像形成装置及び方法を提供することを目的とする。

【0006】
【課題を解決するための手段】本発明によれば、像担持体上に形成される負帯電トナー画像を中間転写体上に一次転写し、さらに転写体上に二次転写する中間転写方式の画像形成方法において、該中間転写体の表面材料が、水に対する接触角が70度以上であつて、帯電帯電率系列が、トナーよりも正であることと特徴とする画像形成装置を提出するものである。また、本発明によれば、像担持体上に形成される正帯電トナー画像を中間転写体上に一次転写し、さらに転写体上に二次転写する中間転写方式の画像形成方法において、該中間転写体の表面材料が、水に対する接触角が70度以上であつて、帯電帯電率系列がトナーよりも負であることを特徴とする画像形成装置を提出するものである。さらに本発明によれば、像担持体上に形成される負帯電トナー画像を中間転写体上に一次転写し、さらに転写体上に二次転写する中間転写方式の画像形成方法において、該中間転写体の表面材料が、水に対する接触角が70度以上であつて、その表面材料の、水に対する接触角が70度以上であつて、その表面材料の帯電帯電率系列がトナーよりも負であるものを用いることを特徴とする画像形成方法が提供される。

【0007】中間転写体表面に形成されたトナー画像が効率よく転写材に転写されるためには、中間転写体表面とトナーの親和性が優れていなければならない。この確

型性を制御する因子としては、両者材料の相溶性や表面の平均的な粗さがある。これに対しては中間胚生体表面の水に対する接触角を70度以上とすれば、かなり改善できる。本実験では、液面の水に対する接触角が、70度以上、好ましくは80〜120度である中間胚生体を用いる。さらに、細胞性の制御因子として、中間胚生体とトナー間のクーロン力も考える必要がある。特に、虫食い現象をなくするためには、その生成原因である中間胚生体とトナー間に生じる局所的強いクーロン力の発生を抑えることが重要である。このためには、中間胚生体表面との摩擦による電荷蓄積を、負帯電トナーの割合、 $4.0 \sim 0.0 \mu\text{C/g}$ 、好ましくは $1.0 \sim 0.30 \sim 0.0 \mu\text{C/g}$ の範囲に、一方正帯電トナーの場合、 $0 \sim 4.0 \mu\text{C/g}$ 、好ましくは $0 \sim 3.0 \mu\text{C/g}$ の範囲に設定することにより、良好な像像が得られる。摩擦帯電量が、前記特定範囲を越えると、局所的帯電が発生しやすくなり、

【0008】図2は、負電性トナールを用いたときの一次及び二次転写工程における荷電状態を示す。中間転写体6に一次転写された直後のトナール22は、図2(a)のように一様に負に荷電している。ところが二次転写

領域においてトナナと中間転写体間に圧力や撥液力などのシエアーがかかること、中間転写体表面の摩擦帯電特性がトナナよりも負極性の強い場合、トナナと中間転写体間の摩擦によって、図2 (b) のように中間転写体表面

上に逆極性（正）に帯電するトナ-23が存在するよう

しては、負帯電性トナーの場合、 $-40 \sim -0.2 \mu\text{C/g}$ 、正帯電性トナーの場合は $-30 \sim 0.2 \mu\text{C/g}$ がよい。また、正帯電性トナーの場合、 $0 \sim 40 \mu\text{C/g}$ 、好ましくは $0 \sim 30 \mu\text{C/g}$ がよい。帯電量が大きすぎると、二次転写の際、中間転写体とトナーとのクロック領域における摩擦により、中間転写体とトナーとのクーロン力 F が転写電界による力 F_1 よりも大きくなり、転写不良による虫食い版面を引き起こしやすくなる。(図2(d))。もちろん、この場合は転写電界の調整による。ある程度までは虫食い版面の発生を減らすことが可能である。しかし、画面解像度が十分となったり、適量の転写電界が必要となったりと好ましくない。

【0011】図3は中間転写体表面とトナーの底層部分の断面の測定に使用する装置である。装置を中間転写体材料331で覆ったローラ径100mmの金属製ローラ332、333は20ミクロンのギャップで平行するように設置している。ローラ32、33はそれぞれ100mm/sec、105mm/secの線速で回転し、回転方向は真

分) フッ素樹脂 (ルミフロン2

ルミフロン用硬化剤 (旭硝子カーボンブラック (プリン

レベリング剤 (KP321
トルエン

公 益 社 會 公 益 社 會

この表面層の水に対する接触角は80度であった。得られた中間胚体材料は負帯電性トナーを用いて、図3の装置により帯電量を測定した。また、中間胚体をカラー複写機（ブリチル550；リコー製（図1、スウィーピーラシ8は設置せず））に用いてテストパターン像を出力した。帯電結果を第1に示す。なお、前掲電

エポキシ樹脂
銅フタロシアニン
サリチル酸亜鉛塩基性媒体

【0013】実施例2

シリコン樹脂 (SR2411; トーダグ)
カーボンブラック (プリンテック)

トルエン
レベリング剤 (KP321; 値

この表面層の水に対する接触角は75度であった。得られた中間転写体材料を用いて実施例1と同様に評価を行

シリコン樹脂 (SR2411; トーダグ)
カーボンブラック (プリンチッ)

レベリング剤 (KP321; 價
¥ミシシモン/SH6020)

トルエン

この表面層の水に対する塩圧力は、大きくのびた。得られた中間駆写体材料を用いて、実施例1と同様に評価し、結果を表1に示した。

特開平9-230714

(7)

フロントページの続き

(72)発明者 瀬戸 尚

東京都大田区中馬込1丁目3番6号 株式
会社リコー内

(72)発明者 福田 茂

東京都大田区中馬込1丁目3番6号 株式
会社リコー内